

Your guide to practical products, technologies and applications

# Automation NOTEBOOK®

Spring 2012

Issue 22

Feature Story

## Cellular Remote Access Gives Companies Competitive Edge



### BREAKING NEWS!

**C-more  
Remote HMI  
App wins  
2012  
Engineers'  
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Available on the  
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### New Product Focus

New NITRA pneumatic tubing  
and fittings, air couplings, blow  
guns, cylinder position switches

#### User Solutions

Alaskan Hatchery Nets  
Automated Alarm and  
Monitoring System

#### Technology Brief

"Starting with Steppers"  
(Part two of a two-part series)

See page 21



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Dial pressure gauge 2.5 inch dial, stainless steel, dual scale, liquid filled, lower mount	\$10.75 G25-SL3000-4LB		\$30.70 56453608	\$23.48 4053K15
Bi-metal dial thermometer 3 inch dial, dual scale, 1/2 inch NPT, 2.5 inch stem, back mount	\$22.00 T30-0250-25C		\$49.03 56426471	\$45.45 3946K11

All prices are U.S. published prices. AutomationDirect prices are from October 2011 Price List. MSC prices are from www.msdirect.com 11/15/11. McMaster-Carr prices are from www.mcmaster.com 11/15/11. Prices subject to change without notice.

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# Automation NOTEBOOK

Your guide to practical products, technologies and applications

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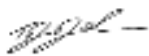
For those who prefer to speak with us in person, please call 1-800-633-0405 x1845. Thanks for your interest, and we look forward to hearing from you.

## Editor's Note

We just had a leap day. This got me to thinking, "When and why did we start having a 'leap year'?" With help from the Internet, I learned that Julius Caesar introduced the first Leap Year during the time of the Roman Empire over 2,000 years ago. The reason given is because it takes the earth 365.242199 days to revolve around the sun. According to scientists, if a Leap day is not added about every four years, then in 100 years, the calendar would be off by approximately 24 days. There's also certain criteria which must be met in order for a leap day to be added to the calendar: the year must be evenly divisible by four AND it must also be equally divisible by 400, otherwise it's not a leap year. ... And all this time I thought it was for AutomationDirect to have more time to provide quality products for our customers!

This issue of NOTEBOOK is filled with interesting articles and bits of information that just might inspire you to try something differently. In addition to information regarding our newest products, this issue is packed with great articles, such as the User Solution story which features an Alaskan fish hatchery. Plus, students at Boise State University are featured in our Student Spotlight segment, trying to break a land speed record with their vegetable oil-powered 1998 Chevy S-10 pickup truck.

There's a lot more, including the ever-popular Breakroom. Test your wits to see if you can solve the mind teasers. But, most of all, sit back, relax, and turn the page...



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# New Product Focus

What's New



## More tubing and fittings, air couplings and blow guns added to NITRA pneumatic line



New models of tubing and fittings have been added to the NITRA line of pneumatic components, as well as blow guns and aluminum manifolds.

Available in 100-foot and 250-foot lengths, NITRA 16mm polyurethane tubing has a shore A 98 hardness rating, provides tight outside diameter tolerance and has superior kink resistance. The ether-based tubing provides excellent hydrolysis, oil and cold resistance. Available in four colors, 16mm polyurethane tubing starts at \$114. A variety of 16mm push-to-connect fittings are available as well.

NITRA brass adapter fittings and plugs are available in 10 different styles to meet most pneumatic applications such as air, water, oil, oxygen, nitrogen, and argon. Machined from yellow brass bar stock or forging, the fittings

withstand pressure up to 800 psi. Designed with NPT threaded connections, male and female connectors are available in 1/8-inch to 1/2-inch sizes, in either two-pack or five-pack quantities.

NITRA pneumatic quick air couplings allow easy changing of tools or hose connections. The quick-disconnect air couplings (female) and plugs (male) are available in three of the most popular styles: IND (Industrial Interchange), ARO and Truflate. The plugs and couplers are designed for 1/4-inch and 3/8-inch hose sizes with male and female NPT threaded connection versions available. Quick-disconnect couplers start at \$5.00. Swivel fittings made of chrome-plated steel with maximum pressure of 145 psi are also available. The quick-disconnect swivel air fittings prevent kinking and strain on supply lines. Two independent-rotation points allow a full 360° circular rotation and 45° angled rotation for better swivel action vs. traditional swivel air fittings. Swivel fittings are priced from \$24.50.

NITRA aluminum manifolds withstand maximum pressure up to 500 psi and are available in two styles. Round manifolds feature one 3/8-inch NPT threaded input and either two or three 1/4-inch NPT outputs. Rectangular manifolds have 1/2-inch NPT inputs on either end and have either three or five 1/4-inch NPT outputs. Manifold prices start at \$6.75.

NITRA blowguns (or nozzles) are available in heavy-duty palm type with safety tip, pistol grips (aluminum and plastic models), pocket, and plastic grip with flexible nozzles in various lengths. The blowguns have a maximum input pressure of 120 psi and start at \$4.25. Additional NITRA accessories include 1/2" thread sealant tape and a two-inch tubing cutter.



## Cylinder position switches

NITRA™ CPSF Series cylinder position switches are designed for IP69K food, beverage and other wash-down applications. The cylinder switches are used with pneumatic cylinders that have a magnet incorporated in the cylinder piston and provide a rugged, cost-effective interface between pneumatic actuators and electrical control systems. The switches are compact and mount on T-slot, tie rod or round body style cylinders with available mounting accessories. These cylinder sensor/switches can be used to provide cylinder position indication, cycle count or to confirm operation. Pre-tested for use with NITRA pneumatic cylinders, CPSF series cylinder switches are also suitable for use with other brands of cylinders with magnetic pistons. NITRA harsh duty pneumatic cylinder position switches are priced from \$22.00.

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We've got the pneumatic parts you need, and they ship the same day\*. New are quick-disconnect hose couplings, which allow easy changing of tools or hose connections. Brass fittings work with water, oil and many compressed gases. Aluminum manifolds give you flexibility in designing a system. And everyone needs a blow gun in their tool kit! See everything at:

[www.automationdirect.com/pneumatic-parts](http://www.automationdirect.com/pneumatic-parts)

### Aluminum Manifolds

Start at:  
**\$6.75**

- Round manifolds with 3/8 inch NPT input, and two or three 1/4 inch NPT outputs
- Rectangular models with 1/2 inch NPT inputs on either end, and three or five 1/4 inch NPT outputs

### Brass Threaded Fittings

Start at:  
**\$4.00**  
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- 10 different styles, including Tee and elbow
- Male and female connectors in 1/8 to 1/2 inch sizes
- Work with water, oil, air and other gases
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**\$4.25**

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# Product Snapshots

*Press Releases*



## Digital pressure switch/transmitters



ProSense digital pressure switch/transmitters are designed for air, no-corrosive gas and non-flammable gas applications. Fitted with a two-meter cable, the precision digital devices feature a three-color LCD display and provide two digital outputs and one analog output. Equipped with a lockable keypad, three operation modes and six pressure unit conversions, these switch/transmitters have two vacuum to pressure ranges (-14.5 to 14.5 and -14.5 psi to 14.5 psi), selectable response times to eliminate chattering, and a fast zero reset. Priced at \$69, and backed with a two-year warranty, ProSense digital pressure switch/transmitters are cULus, CE, RoHS, and Reach approved.

## Safety glasses

Crossfire safety glasses, designed for use in the industrial workplace, combine required eye protection and comfortable fit in a lightweight non-industrial look. Providing excellence in technology and construction, every style meets American National Standards Institute (ANSI) requirements, and is marked with the ANSI Z87 2010 markings to meet the require-



ments of the industrial workplace. Frame styles available include frameless, half-frame, three-quarter frame, and full frame. Available lenses include smoke, clear, anti-fog, mirror, polarized, amber, and foam-lined. Polycarbonate lenses provide superior optical quality and impact protection while blocking 99.9% of harmful UVA and UVB rays. Protective safety eyewear prices start as low as \$2.75.

## More relays



New electro-mechanical and solid state relays including hockey puck style panel mount relays with high load ratings up to 75 amps have been added to our extensive relays and timers lineup. New ice cube style and octal base hermetically sealed (HazLoc) relays are designed for applications requiring sealed relays for hazardous factory locations. (Class I, Div. 2 Groups A, B, C, D). AD-PR40 series power relays are open construction design with high power contacts capable of switching up to 40A. SPDT, DPST and DPDT models are available. Class 8 solid state

relays for up to 10 Amp loads and the similar Class 8 hazardous location series offer energy efficient current switching in a slim housing ideal for space-saving DIN rail or panel mount applications. Industrial control relays start at \$4.50.

## Modular stacklights



WERMA stacklight systems, with modular bayonet-style assembly, allow elements to be mechanically and electrically connected easily and safely within seconds. The 70mm IP65-rated KS 71 series provides up to five elements per terminal base. Light elements include incandescent, LED and Xenon tube models; select elements are available in various light effects (permanent, blinking, rotating, flashing). Audible elements include buzzers and multi-functional sirens. KS 71 light elements start at \$20.50. The 50mm KS 50 modular IP54-rated system accommodates up to four elements with either permanent or blinking light effects. A choice of incandescent or LED light sources is available as well as an 80 dB audible element. KS 50 light elements start at \$20. A wide variety of wall, base, tube, magnetic and fold away mounting options are available.

## Industrial managed Ethernet switches

Stride™ industrial-grade managed Ethernet switches feature redundant power inputs with surge and spike protection and auto-crossover. Built with aluminum housings, all models are designed for an operating temperature



range of -40 to +75 °C. The Stride managed Ethernet switches' proprietary Real-Time Ring™ technology provides the fastest recovery of all the redundancy options on the switch. Most models feature multiple 10/100BaseT RJ45 Ethernet ports; additional models include ST or SC type fiber optic connections. Gigabit managed switches are also available, with 10/100/1000BaseT RJ45 ports and advanced combination SFP ports that accept noise-immune fiber optic links. DIN-rail mountable, managed Ethernet switch prices start at \$445 and are backed by a two-year warranty. Small form-factor pluggable (SFP) industrial Ethernet fiber transceivers have also been added. The compact, hot-swappable transceivers feature LC fiber connectors to add fiber connectivity at Fast Ethernet or Gigabit Ethernet speed. Transceiver prices start at \$78.

### ProSense™ pressure gauges and thermometers

ProSense mechanical dial pressure gauges are available in a variety of configurations for use in most pneumatic, hydraulic, HVAC, plumbing, industrial and commercial applications. These high quality gauges use Bourdon tube sensing elements and do not require any external power sources to operate. Center back mount and lower mount cases are available in durable steel or stainless steel and in either dry or liquid filled to dampen vibration and pulsations. Brass wetted parts are suitable for air, oil, or water applications while stainless steel wetted parts are available



for corrosive applications. Dual marked dial faces (psi/kPa or inHg/kPa) are available in pressure ranges from vacuum up to 6000 psi. ProSense pressure gauges are backed by a five-year warranty and prices start at \$5.75.

The ProSense bi-metal thermometers are general purpose thermometers ideal for applications such as, industrial process, hot/chilled water lines, boilers, HVAC, food processing and wastewater. Constructed of 304 stainless steel, thermometers are available in three-inch dials with center back mounts and five-inch dials with adjustable angle mounts. Both styles feature a bi-metallic sensing element, a dual scale (F°/C°) and re-zero adjustment screws. Models are available with welded stem lengths ranging from 2.5" up to nine inches. Prices start at \$22 and are backed with a five-year warranty.

### Stellar™ basic soft starters



Stellar SR33 Series basic soft starters are designed for general purpose applications where traditional across-

the-line starting or wye-delta starting would typically be appropriate. The SR33 semi-conductor soft starters, available in 22A to 482A sizes, are suitable to control three-phase AC induction motors with a wide variety of motor loads. This series is an ideal substitute for a Star/Delta starter as it fits into a similar footprint, simplifying installation. All units feature two-phase control, easily and separately adjustable motor start voltage and start and stop times, and depending on model, fault indication of 4 or 7 fault types: SCR or Power Supply, Overheat, Control Power Supply, Bypass Relay Failure, Shearpin, Overload, and Overcurrent. Ideal for applications such as pumps, blowers and conveyors, the SR33 series soft starters use thyristors for controlled reduced voltage motor starting and stopping, and then switch to internal contacts for efficient running at rated speed. Backed by a two-year warranty, SR33 series soft starter prices start at \$490. A heat-shrink insulation kit designed to maintain UL compliance when connecting field cables is available for \$8.



# Feature Story

## Remote Access

### Cellular Remote Access Gives Companies Competitive Edge

By Christine Leshner

**N**ew Internet and cellular technology make monitoring and control easier than ever

The automation world, with its distant and often isolated sites, has long sought reliable remote access to cut costs and improve reliability. Instead of sending technicians to distant locations, operators can now access critical information and control systems quickly and easily. Not only does remote monitoring save customers time and money, it also gives OEMs and developers a competitive edge.

The ability to access machines and robots from distant sites isn't new. It began about 20 years ago with dial-up phone service from an OEM's home office to a customer site, then advanced to hard-wired Ethernet/Internet connections. Now cellular technology and smart phones are making it possible to access systems from just about anywhere.

Cellular connections have become much more reliable thanks to new 4G technology; cell phone apps can even match hard-wired connections in terms of speed. As a result, machine and robot builder OEMs can now develop applications that offer remote access via a web browser and apps from smart phones.

#### Staying Competitive With Remote Access

One company that benefits from the newest remote access technologies is Samuel Jackson Inc. ([www.samjackson.com](http://www.samjackson.com)), a builder of moisture control systems in Lubbock, Texas, whose clients mainly operate in

agriculture. Mark Gentry, an engineer at Samuel Jackson, says remote access is vital for their business.

"Remote diagnostics and monitoring can be huge in our industry where our customers literally make all their income for the year in just a few weeks," explains Gentry, engineer for Samuel Jackson, in Control Design's December 2011 cover story, "Remote Access Makes New Connections." He concludes, "When your entire year's income is made in 6 to 12 weeks, the cost of downtime takes on a whole new meaning."

To see more information on how Samuel Jackson uses remote access, see the sidebar, "Reach Rural Customers Using Remote Access."

#### Expanding Services

In addition to being able to assist their customers from just about anywhere, more machine builders are providing troubleshooting from their offices, saving customers downtime and travel expenses while providing instant support.

Some machine builders are taking this a step farther by offering preventive maintenance options via remote access. The collected data is used to optimize machine performance and schedule maintenance.

Machine builders can also use collected data to build system performance trends, which helps optimize their equipment and improve machine efficiency. Some builders are already offering this as an add-on service.

#### The Challenges of Designing for Cellular Remote Access

Using a smart phone is the latest step in providing remote access. Greg Philbrook, HMI/Communications product manager at Automation Direct ([www.automationdirect.com](http://www.automationdirect.com)) in Cumming, Ga., describes how smart phone apps for remote access and control are developed in the Control Design, December 2011 cover story

"Remote Access Makes New Connections." According to Philbrook, "These apps make use of the VNC utilities or are custom-designed to communicate with the manufacturer's device through supported protocols."

In the same article, Philbrook adds that it's not always as easy as it looks. "Developers have to increase hardware, software and protocol performance levels to reduce the latencies that can occur over remote connections, allowing users to operate with minimum frustration," he advises. "OEMs must consider remote connections when designing projects that run on the devices. Reducing the amount of data transfer that occurs with programs running in PLCs and HMIs should be a goal if remote connections are a possibility."

It's important also to consider the device that will be used to connect to the remote controller when designing application software projects. For example, if a mobile phone app is going to be used to access the system, the screens should contain fewer objects to deliver good operability on small devices.

#### VPN or Cellular?

As the benefits of remote access become more widespread, a debate is brewing about which technology is the best method for remote access: hard-wired or cellular connections.

A company may use proprietary dedicated communications hardware to establish a secure link between its machines in the field and home office. Other providers offer remote connectivity via a hardware Virtual Private Network (VPN). This type of connectivity doesn't route through an HMI or PLC; it just goes from router to router via an Internet VPN. A web browser interface is used to interact with machines.

"For remote connectivity, we use an on-demand VPN connection," reports Mark Gentry of Samuel Jackson in the Control Design, December 2011 cover story. "Our technical staff can



access customer sites from any Internet connection, and our customers can access their own plants using the same VPN from anywhere, including their iPhone."



Image 1: Like many other OEMs, machine builder Samuel Jackson prefers app-based smart phone remote access to browser-based access, finding it to be quicker and easier.

"We use the remote connection to upload PLC updates, monitor the HMI and make adjustments to the programming," he continues in the article. "In the event that a customer has an issue, we use the VPN to check machine status and determine if a technician must be sent out."

While some prefer to use a VPN, the newest cellular apps, such as the *C-more* Remote HMI app from AutomationDirect, have a huge advantage because they are so affordable.

Joel Froese, owner/operator of the Red Bank Hydro Plant in Columbia, S.C., prefers his cell phone for remote access. "The *C-more* Remote HMI app allows me to check the status of the machinery at our hydroelectric plant from my iPhone even when I am away from my computer," he explains in the Control Design, December 2011 cover story. "I feel the future has arrived as I can even start up or shut down the plant from the road."

"The HMI screen scales perfectly to the iPhone screen in any orientation, and built-in safety features ensure that I don't accidentally push the wrong button, so it's well worth the \$4.99 price," says Froese in the article.

#### Why Not Just Use a Browser?

While five dollars is certainly cheap, why would users need an app when smart phone browser-based access is free?

There are certain differences between the methods of access. Remote browser access provides a snapshot of the HMI screens, which is important when monitoring the plant from a computer or other Internet-connected device.

However, the *C-more* iPhone app offers a live view of the screens. Users have near real-time views of monitored variable changes.

The most important difference between the two is in terms of control. The browser access provides read-only access, while the iPhone app enables users to actually control the plant remotely.

"We already had browser access to this information thanks to the built-in web server in the *C-more* HMI. But, the iPhone app now allows us to control the plant via the on-screen buttons, so we can now start up and shut down the system just as if we were standing in front of the HMI," explains Froese in the Control Design article.

#### Security

Naturally the question of security is at the forefront of users' minds. We've all heard stories about cell phones and Internet sites being hacked. It can be relatively easy for a hacker to gain access to almost anyone's connection in a public place, such as an airport equipped with WiFi. Therefore, it's important that remote access be carefully engineered using qualified resources, as well as a proper evaluation to ensure there's a good cost/benefit ratio.

## Remote Access Methods

Proprietary connections via Internet using dedicated hardware at both ends
Web browser access with open connections
VPN connections via the Internet
Cellular connections with VPN
Cellular connections for web browser access
Cellular connections via an App

Table 1: Remote Access Methods

## Remote Access Issues

### Security

Need to increase hardware, software and protocol performance
Reluctance on the part of the IT department or control engineers
Availability and speed of cellular or Internet access
Machine control system's ability to support remote access
HMI displays may need to be revised for mobile devices

Table 2 Remote Access Issues

Continued, p. 10>>

# Feature Story Cont.

## Remote Access

### Reach Rural Customers Using Remote Access

Samuel Jackson Inc. makes moisture control products for drying and moisture restoration systems, largely used in agricultural applications. The company was started with the invention of the Humidaire system, which didn't need steam to generate warm moist air.

Since many of its customers work in the agricultural industry they are often located in distant areas or operate seasonal businesses, such as cotton gins. This has made remote access a necessity for the company to do business.

"Simply saving a few hours of driving time for a service call to diagnose a problem can be massive for our customers," says Mark Gentry, an engineer for Samuel Jackson, in Control Design's December cover story "Remote Access Makes New Connections." In the article he explains: "It allows us to cover customers across a wide area very quickly. As an example, just today I was able to help customers in Arkansas, Georgia, Texas and North Carolina whom I wouldn't have been able to help without the ability to see what they were seeing."

The company's products use AutomationDirect PLCs with *C-more* HMIs. "Without a doubt the most popular remote access capability we've given our customers is the AutomationDirect MobileMirror iPhone & iPad app that allows them to watch their operation in real-time," reports Gentry in the same article. "The app connects to the *C-more* screen and allows us to navigate screens easily."

He prefers to use an app over a web browser to gain remote access. "With a browser on a mobile device, you have to load a page including all

the headers, graphics, and other overhead that entails," he explains in the story. "With an app, the only thing you need to pull is the data itself, which in most cases doesn't amount to very many bytes. The customers don't really understand this, but they do understand that the app is very quick to get going and very fast in operation."

According to the article, having Internet access to his customers' sites is the biggest challenge in implementing remote connectivity. "Most of our customers are located far away from metropolitan areas, and many are several miles from even the nearest small town," Gentry notes. "Thankfully, there are more and more wireless ISPs popping up in rural America, and those seem to be one of the best methods for Internet access we've found."

#### Continued from, p. 9


There are methods for making a wireless connection more secure. A VPN connection to a Local Area Network (LAN) can offer security.

Cloud computing security can be improved by giving rights to the application running on the device. This allows access to data only when the user has an approved device and a proper login and password.

Many times the type of security required depends on the type of user. Smaller companies typically don't have dedicated IT security personnel. Their security may consist of a firewall, an Internet router that uses Packet Address Translation (PAT) as well as an operator opening the connection from the machine or robot.

Large corporations typically have a dedicated IT security staff as well as advanced network architecture. When working with these companies, a path to the machine or robot is necessary. This involves numerous security policies and considerations, which can be cumbersome.

In addition to IT department considerations, the technology and network settings might be a bit daunting to some plant managers and control engineers. Therefore, good security measures must fit the type of organization as well as the people who will be interacting with it (i.e., the IT department, plant managers, control engineers and operators).

While remote monitoring and access via cellular technology may not be simple to provide and has some risks, it is an important option to consider. As businesses become more global and communications more important, having the ability to offer remote access may be the deciding factor in who is awarded a contract. 

*Originally appeared in the Control Design, December 2011 cover story*



# C-more® Remote HMI

mobile application for iPhone® and iPad®



**\$4.99**

Automationdirect has released its first mobile application for the iPhone and iPad! The Remote HMI app is just one of the many advanced features you will find in the C-more product line.

The Remote HMI App lets you remotely monitor or control the machine process from an iPhone or iPad as though you're standing at the C-more panel.

## Do all this from the palm of your hand!

- Monitor and control screen operations of the C-more panel as if touching the panel itself
- Save JPG screen captures to review, email and print if needed
- Zoom in on specific objects on the screen and then save a screen capture if needed (using iPhone or Apple zoom feature)
- Multilevel Logon Security supports three Remote Access user accounts
- Multilevel Access Control allows each account to be configured in one of the following levels of access: Full control, View only, View and Screen Change only.
- Screen Lock/Unlock button reduces unintentional activation of the remote C-more panel inputs
- Remote HMI app requires software and firmware Version 2.73 or later\*, and an Ethernet-enabled C-more panel to function.)
- Activation or Notification Tags allow each account to have associated user configurable TAGS so the Panel project or PLC project can indicate that a remote user is connected, or to enable or disable the remote access feature. These tags can activate alarms, events or notifications to alert local operators that a remote user is connected.



Remote HMI works with iPad 2, iPad, iPhone 4, iPhone 3GS, iPhone 3G, and iPod touch®.

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For complete details on **Remote HMI** or to order, visit:

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Solid state relay, panel mount, hockey puck style, 3-32 VDC input, SPST, normally open SCR, 10A, 24-280 VAC load, zero cross

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# System Integrator Corner

Canada Direct

## AutomationDirect's SI Direct Program is now in Canada!

By Tim Roberts,  
Business Development



RPM Automation Inc. is a system integration firm located in Edmonton, Alberta, Canada. As a member integrator of the SI Direct Program, RPM provides an array of design and integration services across industries including manufacturing, oil/gas, water/wastewater, material handling and pulp/paper.

Stephen Goodwin founded RPM Automation in 2005, with the goal of delivering technical solutions that enhance productivity and safety to ultimately maximize customers' profitability. Mr. Goodwin is a Certified Electronic Engineering Tech with 31 years of engineering experience in the automation industry.

Building on a solid foundation of Medium Voltage AC Drives (commissioning throughout North America and Russia) and PLC/HMI design and programming, RPM Automation has utilized various AutomationDirect products in customer applications. Among these product lines are: *DirectLogic* PLCs, *C-more* and *C-more* Micro HMI touch panels, *DURApulse* VFDs, and *Productivity3000* PAC systems.

RPM Automation also provides timely industrial troubleshooting expertise on various integrated control systems, even hydraulic and pneumatic systems. They work with in-house maintenance teams and independently as needed to identify and eliminate causes of costly system downtime.

In 2011, a prominent and innovative fuel distribution company approached

RPM Automation with the need to automate an oil-water separator. RPM chose the popular *DirectLogic* DL06 PLC for the job. The DL06 was programmed to read nine discrete inputs from a dedicated level-detection system as well as temperatures for the electrical cabinet, outdoors, and tank ambient via an RTD card. The data is displayed on a six-inch *C-more* panel. When critical oil/water levels, temperatures, or Hydrocarbon levels are detected, the *C-more* HMI will email these alarms to the computers/smart phones of techs and managers so the situation can be dealt with promptly. The end user has remote access to the HMI to view all pages live to see what is happening in the field.



The control cabinet above, designed by RPM Automation Inc., contains seven *DuraPulse* drives plus motor controls purchased from AutomationDirect. RPM Automation Inc.'s customer, Steel-Craft Door Ltd, in Edmonton, Canada, produces high quality garage doors and associated hardware for commercial and residential purposes. Learn more at their Web site: <http://www.steel-craft.ca/>

Very pleased with the first project, the company then asked RPM to work with them to design and build a prototype control/monitor system for another project. RPM Automation went to work, designing the system around the *Productivity 3000* (P3000) PAC and two 15-inch *C-more* touch panels which monitor/control the new system. Further details will be released upon completion of this unique project.

AutomationDirect is pleased to welcome RPM Automation to the SI Direct Program as the first member integrator in Canada!

Please contact Stephen Goodwin for more information.

**RPM Automation**

Contact: STEPHEN GOODWIN

Phone: 780-237-5700

E-mail:

[stephen@rpmautomation.com](mailto:stephen@rpmautomation.com)

"I have six locks on my door all in a row. When I go out, I lock every other one. I figure no matter how long somebody stands there picking the locks, they are always locking three."

— Elayne Boosler

# User Solutions

## A Real Fish Tale

### Alaskan Hatchery Nets Automated Alarm and Monitoring System

By Benjamin Smith  
Maintenance Supervisor,  
Hidden Falls Hatchery, Sitka, Alaska

**U**pgraded alarm and monitoring systems keep fish, and Alaska's economy, alive.

Alaska leads U.S. states in the value of its commercial fishing catch. The Alaska salmon industry represents the world's only sustainable salmon fishery. And with seafood being Alaska's largest export, excluding oil and gas, the Alaska hatchery system plays a vital role in the state's economy. Salmon hatcheries in Alaska are directly funded by, and directly support, the fishing fleets and fishing industry.

Our facility, Hidden Falls Hatchery, is operated by the Northern Southeast Regional Aquaculture Association. It's located on Baranof Island at Kasnyku Bay on Chatham Strait and is accessible only by boat or float plane (*Figure 1*). Hidden Falls is one of the largest fishery enhancement programs in Southeast Alaska.

Some attempts were made in the past to automatically monitor the facility. A PLC installation was started in 1991 to monitor the vacuum system, but it was never completed. The PLC had a CPU fault, so the project was scrapped. The hatchery site was, in



**Figure 1:** This photo shows a bird's-eye view of the entire Hidden Falls Hatchery facility.

essence, unmonitored—and the value of monitoring critical systems at hatchery sites can't be overemphasized.

We needed a fully functional automation and alarm system to monitor the processes vital to keeping the fish alive and healthy. The goal was to have a fully integrated alarm and monitoring system covering all aspects of the site, especially the aquaculture fish cultivation systems.

We researched our options and designed a system to monitor the site. We chose *Direct*LOGIC DL06 PLCs, *C-more* 15- and 6-inch touch screen HMIs, and a Stride unmanaged Ethernet switch, all from AutomationDirect. We also selected a NetGear managed switch, Ubiquiti Networks PicoStation access points, as well as AutomationDirect ProSense temperature and pressure transmitters.

#### Hidden Falls Hatchery Facility

Because of its remote location, Hidden Falls Hatchery must operate sustainably to support the site's aquaculture, mechanical systems, and residences. The hatchery's aquaculture includes the main incubation building, a secondary incubation building, and two fields of circular rearing containers (*Figure 2*). See the sidebar "Salmon Life Cycle and the Hatchery Process" for further hatchery operation details.



**Figure 2:** Hatchery's aquaculture includes the main incubation building, and two fields of circular rearing containers.

The mechanical systems include the vacuum building, the hydroelectric building, and the maintenance shop. The site also supports six housing units and a bunkhouse used for temporary and seasonal employees.

The new alarm and monitoring system alerts the small onsite staff immediately if a problem is detected. This allows our staff to monitor incubation and rearing container water levels and flows—and also track runtime on equipment, monitor trends and analyze abnormal conditions.

The main hatchery building houses the primary incubation PLC and 15-inch HMI (*Figure 3*), which also serves as the main alarm panel for the hatchery. This PLC/HMI system connects to the hatchery's Ethernet LAN through a NetGear managed switch. The hydroelectric and load-bank PLC/HMI systems as well as a Wi-Fi Bridge connect to the LAN through the Stride unmanaged switch (*Table 1 and Figure 4 on pages 16-17*).



**Figure 3:** The HMI located in the main incubation building serves as the primary alarm panel for the hatchery.

In addition, two residence-mounted 6-inch touchscreen HMIs connect to the LAN via Ethernet.

In cases where the PLC is in close proximity to the HMI, communication is handled using AutomationDirect's *Direct*Net Link. Where the PLC is at some distance from an HMI—as with the vacuum building and front round pond PLC—the network connection is made with an ECOM100 Ethernet module and Wi-Fi bridge.

The HMIs are essentially the only direct means for user input. Each alarm can be acknowledged or disabled from its associated HMI. We can change setpoints from the HMI as well. With this system, any HMI can see everything that's happening on the hatchery site. This visibility is very important to our small staff.



We divided the monitoring and alarm duties according to the type of process to be protected: aquaculture or mechanical systems. Due to the distances between parts of these systems, we further divided the system by using multiple PLCs placed in close proximity to the systems they monitor or control. Alarms for each system are interpreted by that system's PLCs.

### Monitoring Hatchery Aquaculture

Survival of the fish depends on the reliability of the alarm system monitoring the hatchery's critical processes. Every part of the hatchery's water flow from the supply lake on down to the sea can impact the water flowing to the fish. The earlier we can detect a problem upstream, the more likely we're able to head off situations that could affect the salmon fry.

Incubation is the heart of any hatchery operation. Water for the incubators passes through six head boxes: four in the main incubation area and two in the rear incubator area. Head boxes are open-air troughs that supply low-pressure water to the incubators (*Figure 5*). They're positioned several feet above the incubators and use gravity flow to supply the water.



**Figure 5.** Head boxes are open-air troughs that supply low-pressure water to the incubators, and pressure sensors continuously monitor the head boxes.

The head box alarm system monitors the incubators. Low or high head box levels can result in loss of water to salmon fry. Loss of a single incubation row could result in losing millions of fish, which could have an enormous economic impact on the Southeast Alaska fisheries.

Head boxes are monitored continuously using 0-100-inch water column pressure sensors, which allow us to measure levels to the nearest 0.1 inch. These pressure sensors connect to the analog inputs of their respective PLCs for the main and rear incubation areas. The continuous readouts on the HMIs provide visual evidence that the pressure sensors are working.

Three PLCs monitor critical aquaculture parameters by receiving sensor information via their DC inputs:

1. Main incubation alarm system consisting of a PLC and a 15-inch HMI
2. Rear incubation and rearing pond alarm system consisting of a PLC, 6-inch HMI, and a Wi-Fi node
3. Front rearing pond alarm system consisting of a PLC and a Wi-Fi node.

These PLCs monitor water levels and flows on all of the incubation and rearing containers. Float switches connected to the discrete inputs of the appropriate PLCs monitor rearing container water flow.

### Monitoring the Hatchery's Mechanical Systems

Two other PLCs monitor the hatchery's mechanical systems, namely the vacuum building and the hydroelectric building. The hydroelectric building contains the automated load-bank control system. These PLCs and their associated HMIs allow us to track equipment runtime, monitor trends, and analyze causes of abnormal conditions.

The vacuum building is located near Hidden Falls Lake, which is a 15-minute hike up the hill. The vacuum building alarm system consists of a PLC and Wi-Fi node at the vacuum building. The vacuum system alarms are transmitted wirelessly, and displayed and acknowledged at the incubation HMI in the main hatchery building. Personnel can meet there to discuss alarm conditions before climbing up the hill, which can be quite an adventure in winter.

The vacuum building houses a pair of duplex 2.6-hp liquid-ring vacuum pump systems that maintain vacuum on

their respective pipelines. Vacuum system parameters are monitored by the PLC, and are relayed to our main incubation alarm system over Wi-Fi. The PLC monitors and alternates runtime equally for each vacuum pump.

We're off the grid, so we get our power from our 250 kW hydroelectric turbine/generator. Water for the turbine/generator is fed from the lake through two large pipelines. We also have a standby generator and a load bank. The hydroelectric and standby generators are tied to the load bank, which dynamically adjusts system load to maintain desired water flow. The load bank is controlled and monitored by a PLC and a 6-inch HMI, connected to the Ethernet LAN.

The hydroelectric turbine/generator's monitoring and alarm system consists of a PLC and a 6-inch HMI. An illuminated annunciator board displays turbine/generator, backup generator, diverter, and load-bank related alarms.

The hydroelectric PLC monitors water temperature and pressure; oil temperature, pressure, and level; and transfer switch position. This PLC also monitors the automatic diverter system, which provides water for the hatchery if the turbine/generator trips.

### Alarming Success

Since the hatchery's integrated monitoring and alarm system was installed, it has alerted us to several major situations that would otherwise have gone undetected, each of which would have been emergencies.

On several occasions, clogged intake screens on the head box water supply resulted in low head box water levels. The alarm system alerted the staff before any loss of water to the fish actually occurred.

The HMI tells the staff exactly what causes an alarm condition. If high or low head box alarms occur, the HMI identifies the specific head box. In addition, the water levels are continuously charted and recorded, allowing staff to determine exactly when and how

**Continued, p. 16>>**

# User Solutions Cont.

## A REAL FISH TALE

Continued from, p. 15

### Hidden Falls Alarm & Monitoring Network

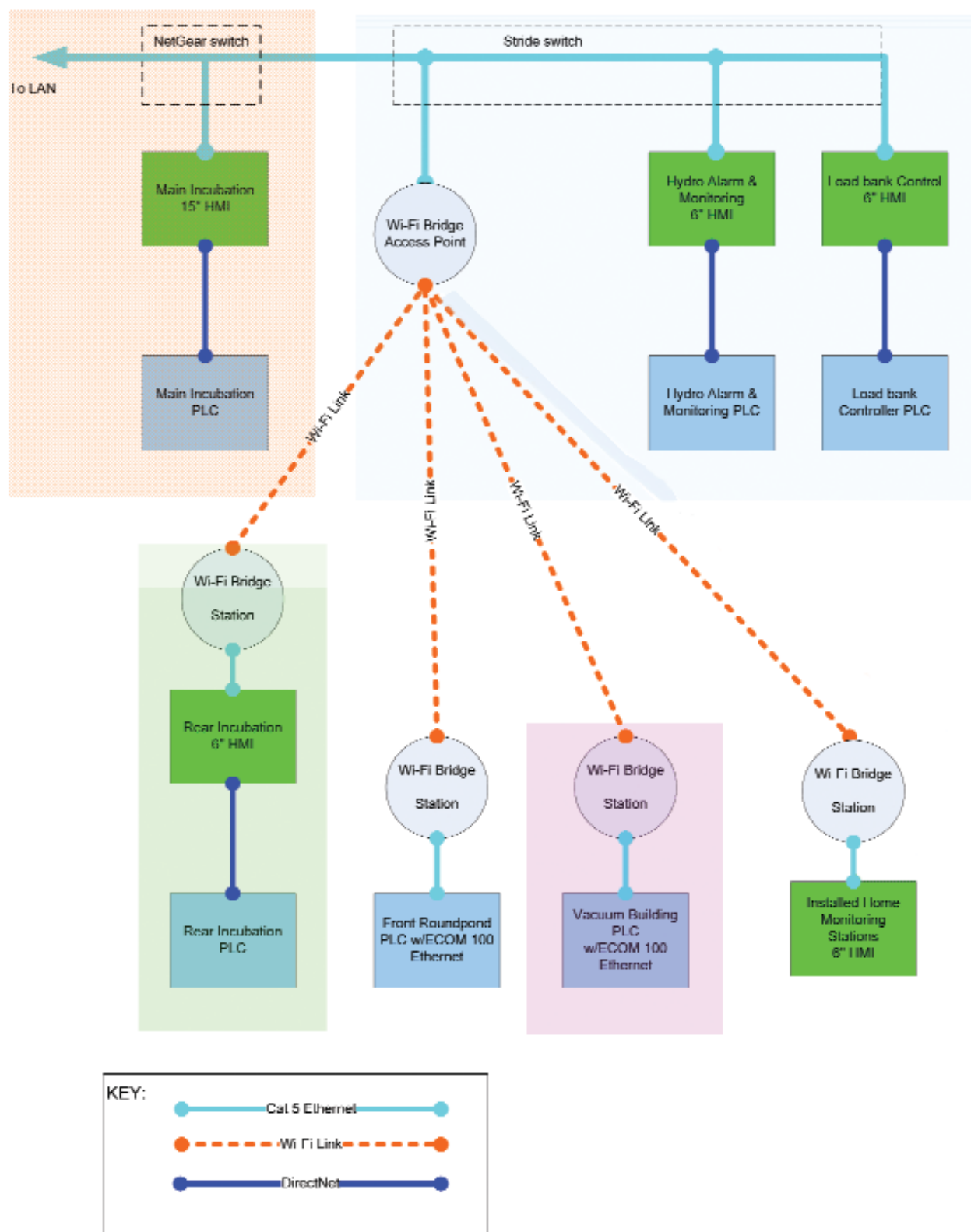


Figure 4: This diagram illustrates the PLC, HMI, and wired and wireless networks at Hidden Falls Hatchery.



## Alarm and Monitoring Systems as Depicted in the Figure 4 Diagram

<b>1. Main incubation—PLC and 15-inch HMI</b>
<b>2. Secondary or rear incubation and rearing ponds—PLC, HMI and Wi-Fi Bridge</b>
<b>3. Front rearing ponds—PLC and Wi-Fi Bridge</b>
<b>4. Vacuum building—PLC and Wi-Fi Bridge</b>
<b>5. Hydroelectric system—PLC and 6-inch HMI</b>
<b>6. Load bank—PLC and 6-inch HMI</b>
<b>7. Residence or Home, two systems—6-inch HMI and Wi-Fi Bridge</b>

**Table 1**  
(See Figure 4 Diagram on page 16)

the alarming condition occurred. Each HMI accommodates a USB thumb drive where we log files of every alarm and charts for virtually every parameter we monitor.

On another occasion, a condition at the hydroelectric plant turned into a loss-of-power emergency. Water pressure dropped too low to meet turbine/generator water demand, which also affected water flow to the head boxes, and the head box water level dropped below the alarm setpoint. The resulting head box low water alarm preceded the loss of power alarm by about 1 minute, allowing us to take corrective action.

The equipment from AutomationDirect allows us to continuously monitor the water supply and mechanical systems as a whole. The new alarm system allows us to spot previously undetected issues before they cause more trouble.

The determining factor for choosing solutions from AutomationDirect was pricing. However, we've since realized additional benefits from the variety of available add-on PLC modules, the user-friendly software, and the extensive technical documentation

available on:

[www.automationdirect.com](http://www.automationdirect.com).

AutomationDirect service has also been first-rate, and the technical support and the technical forums have been extremely valuable. We sometimes feel quite alone in our isolated location, so it's good to have a partner that we know will be there to answer our questions.

## Salmon Life Cycle and the Hatchery Process

Hidden Falls Hatchery rears more than 100 million chum salmon, and several million Chinook and Coho salmon, all of which are released each year as smolts. Smolts are young salmon that leave fresh water to go to the sea. In three or four years, the salmon return to fresh water to spawn. Because of their homing instinct, the fish seek the fresh water from their childhood.

From the ocean, the returning fish come into Kasnyku Bay. We carefully segregate a portion of the returning fish into a small portion of the bay enclosed by a barrier net. These fish are then referred to as brood stock. The brood stock are admitted into a fresh water lagoon in controlled numbers using a weir.

When they are ready, we start water flow to a fish ladder that leads to several raceways. Fish in the raceways are then spawned by a crew of about six people. The eggs and sperm are extracted and combined. The fertilized eggs are then placed into incubators.

Water from Hidden Falls Lake operates the turbine/generator at the hydro-electric building. The discharge water feeds the low-pressure hatchery water supply, which in turn feeds the incubators and rearing containers. Any failure or mistake at this point could kill millions of fry, or young fish. This is true until the fish are introduced to their saltwater rearing pens or directly released to the sea.

After an incubation period of several months, the fry are introduced into saltwater rearing containers. Maintaining water flow to these containers is vital. If the water flow is stopped or significantly altered, the oxygen in the water is quickly used up, resulting in mortality of the fish.

# Tech Thread

## Stepper Systems

### “Starting With Steppers” (Part two of a two-part series)

By Tom Elavsky,  
AutomationDirect

Part One of this series (in Fall 2011, issue 21) started with a complete reference to the technical information available from AutomationDirect that can help you understand and select components from the *SureStep* family for an open-loop motion application. It also reviewed the hardware methods for controlling your system, including PLC high-speed I/O or counter modules. Part two discusses the serial communications control method and includes additional reference document links.



#### ASCII Serial Communications Control

The second method for control is done by taking advantage of the advanced stepper drives' ability to accept ASCII data commands via RS-232 serial communications. This method is supported from certain serial ports of all *DirectLOGIC* PLCs, *CLICK* PLCs, and the *Productivity3000* Programmable Automation Controller. Review the instruction set for the specific PLC and investigate the instructions that can produce the ASCII data commands. Then confirm which RS-232 serial communications port is supported by those instructions, usually configurable as an ASCII port.

The complete *SureStep* Advanced Microstepping Drive SCL User Manual is available at: <http://bit.ly/p5p2GA>

The user manual covers the *SureStep*

Pro configuration software, communications, and describes each serial ASCII (SCL) command in detail.

A helpful application note has information and examples on using the various SCL commands, found here:

<http://bit.ly/qdqoq8>

The application note details many ASCII SCL commands and gives examples of various types of moves that can be executed using them.

Here is an example, with comments, of the ASCII commands that would be used to perform a basic move sequence called the FC Move. This move is sometimes called a "blended" or "high-speed/creep" move. It is fully defined as "Feed to Length, with Speed Change". Its sequence of operation is as follows:

Accelerate up to a certain speed, and continue at that velocity until reaching the "DC" (Distance Change) value. At this point, it will decelerate to the VC (Velocity Change) value and continue until it nears the end of the move. Then decel and stop when it reaches the DI (Distance) value, which is the overall move length. (Profile shown in Figure 1)

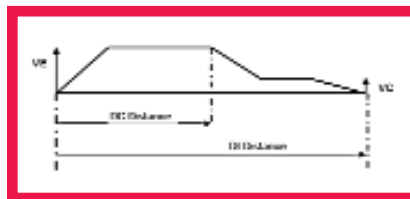


Figure 1: FC Move profile

The actual commands are:

1. "MD" "Motor Disable", always do this when changing Command Mode settings.
2. "CM21" "Command Mode 21", makes sure the drive is set to Point-to-Point positioning mode.
3. "AC2" "Accel", sets the accel, which will apply to the starting ramp. Both Accel and Decel are independently adjustable, if desired
4. "DE2" "Decel", sets the decel, which would apply to both changes decel ramps.
5. "VE3" "Velocity", sets the peak velocity of the move.

6. "EG1000" "Electronic Gearing", sets pulses per rev

7. "ME" "Motor Enable", enables the motor for motion

8. "DI90000" "Distance", this is the overall move distance

9. "DC60000" "Distance Change", this is the point during the move at which the velocity will change.

10. "VC0.5" "Velocity Change", this is the second velocity (typically lower than VE) which the drive will go to after it reaches the DC length.

11. "SA" Saves the parameters in the drive.

An "FC" command initiates the move. After the other settings are loaded to the drive, this is the only command required for the drive to execute the move.

The "Intro to Motion Control" tab at the bottom of the application note has some very useful information about point-to-point and absolute positioning. (Note the series of tabs with additional special topics.)

As an example, the *CLICK* PLC currently does not support high speed inputs and pulse outputs, nor is there a *CTRIO* module available for the *CLICK*. But with the use of a *SureStep* advanced microstepping drive, the *CLICK* can be programmed to send SCL commands to the drive in order to perform motion. In the case of the *CLICK* PLC, we can use the "Send" instruction to put together an ASCII string of data that can be communicated to the advanced drives. Page 4-29 in the *CLICK* PLC Hardware User Manual shows an example of ASCII "Send" instruction programming. The *CLICK* user manual is available at:

<http://bit.ly/nx7Fe6>

The Online Help file for the *CLICK* PLC has additional details on using the "Send" instruction, and the free programming software can be downloaded at:

<http://bit.ly/ox2FTJ>

Any *DirectLOGIC* PLC capable of RS-232 ASCII communication can write serial commands to the *SureStep* advanced drives (STP-DRV-4850 and -80100). These PLCs include DL05, 06,



# Student Spotlight

Boise State Student Club

250-1, 260, 350, and 450 models.

However, we strongly recommend using DL06 or D2-260 based PLCs for serial commands due to their more advanced ASCII instruction set, which includes PRINTV and VPRINT commands.

The advanced microstepping drives include the *SureStep* Pro configuration tool on CD. It can also be downloaded online at:

<http://bit.ly/oa3kIE>

The software can be used for easy configuration and setup of the drive, its control mode, I/O and attached motor.

The Online Help file included with the software will help in understanding all the features that can be set up, configured and tested with the tool. The software's built-in command line is terrific for testing and troubleshooting SCL commands.

## Additional Information

The following links are additional information that you may find useful when working with the *SureStep* stepping system and related controls:

AutoCAD (tm) Template Drawings:

<http://bit.ly/nZxbf>

Look for *SureStep* Stepping Systems under the Drives, Motors and Motion Control category. The zipped file size is 0.97 MB.

FAQ's:

<http://bit.ly/pBKeZx>

There are several FAQs that may help answer some of your questions.

View the AutomationTalk webinar on Motion Control with Micro PLCs at:

<http://bit.ly/oiC33S>

This webinar features a DL05 PLC with an H0-CTRIO High-Speed Counter Module interfaced to a *SureStep* stepping motor, drive and power supply. The motor is coupled to a linear ball screw slide. The tutorial reviews the use of the CTRIO Workbench configuration software utility to create profiles. It also covers the supporting ladder logic and using a *C-more* Micro-Graphic touch panel to execute a homing profile, velocity profile, trapezoidal profile, and jogging.

## Greenspeed chases green fuel speed record

By Chip McDaniel  
AutomationDirect



**G**reenspeed is a group of seven students at Boise State University who are on a mission to create the world's fastest vegetable oil-powered vehicle. Where did they come up with such an idea? Dave Schenker, the president of Greenspeed, explains that about ten years ago he heard about, "some old guys who were running a 'vintage' Mercedes Benz on vegetable oil". He was intrigued. He then spent several years experimenting with diesel hot rods. His quest to fully understand the science involved led him to engineering school. So fifteen years after his formal (home school) education had ended, Dave decided to study engineering at Boise State. He spent some time as an undergrad researcher in the material science department, which helped him stay hands-on, but he couldn't shake the call of the racing world, and he remembered the "two old guys and their vegetable oil". An extensive search revealed an interesting number; the top speed ever recorded for a vegetable oil-powered vehicle was only 98 mph!

As a full-time student, Dave could no longer afford the racing toys he was used to, but the concept of an officially-sanctioned student club at Boise State offered the means to raise both interest among his fellow students and the sponsorships and donations required to fund the endeavor. In 2010 the group achieved official "student club" status, and in 2011, their third year, things began to happen fast: In March, the students, with the help of a generous donor, bought a 1998 Chevy S-10. In late May, some shop space was donated, and by August they had completed their first high-speed run. In less than three months, the club had raised enough donations (in cash & parts) had completed the overhaul and construction of the truck from the ground up, and made it to the salt flats for a pair of high speed runs!

## Class Rules

Diesel trucks compete for top speed records in several classes: Unlimited Diesel Truck (UDT), Modified (MDT), Highway Hauler (HH), and Diesel Truck (DT) class, with various engine sizes allowed per class (from AA to F). The fastest time recorded for any vehicle operating on vegetable oil happened to be for an unlimited class truck at 98 mph. But this time was not considered an official world record, as there is no separate distinction for the various fuel types. Greenspeed competes with a class "C"

**Continued, p. 20>>**



The team celebrates breaking the land speed record!  
Photo credit: Luke Salewski

# Student Spotlight cont.

Boise State Student Club

Continued from, p. 19



Photo credit: Holly Salewski

engine in the DT category or CDT for short. The top speed for a CDT class vehicle, regardless of fuel type, currently stands at 215.091 mph (set by a truck running on petroleum diesel).

Greenspeed originally petitioned the sanctioning body, the Southern California Timing Association, (SCTA) to allow vegetable oil vehicles to be considered as a separate class, but their petition was declined. The SCTA ruled that vehicles running on vegetable oil aren't eligible for a separate world record, but can compete for an "official time". [Now, after seeing the success of the Greenspeed team last year, the sanctioning body has changed the rules to officially allow the use of vegetable oil in the same classes with petroleum diesel and biodiesel.] It's hardly an advantage though, as the team reports that, on average, vegetable oil has only about 90-95% of the energy contained in a comparable amount of petro-diesel.

## Aerodynamics

The sanctioning body allows significant changes to all vehicles in the interest of safety, but in the DT class there are significant aerodynamic restrictions. The DT Class rules stipulate that all the body panels must be identical to, and in the same physical relationship to each other as they are on the production version of that model truck. A custom air dam (under the front bumper), and an optional bed cover are the only allowed aerodynamic changes to the truck. The team performed a simple Computational

Fluid Dynamics (CFD) analysis and used the results to optimize their air dam design, but ran out of time to mount the dam, and ended up using only the stock bumper. The team also studied the aerodynamics of covered and uncovered beds, collected lots of anecdotal evidence, and performed another CFD analysis, with various portions of the empty bed covered. But in addition to the severe time constraints, the team questioned the accuracy of their simple CFD model, and thus the results of the analysis. They feel certain that a bed cover would only make a few miles-per-hour of difference, one way or the other, at top speed and they look forward to collecting empirical data to back up the computer modeling. They ended up running with an open bed in 2011.

## Engine

Class C entries are limited to a six-liter displacement engine. Greenspeed choose a 12-valve Cummings 5.9 liter V6. It's a "fully-built" drag race engine, with a custom twin turbo system. Greenspeed used a number of AutomationDirect ProSense® temperature and pressure sensors to monitor the engine, and transmission and vegetable oil temperatures, as heated vegetable oil burns more efficiently.

One of the most innovative aspects of the Greenspeed entry is their use of a pair of ProSense pressure sensors, a proportional valve, and a PID loop to control their turbocharger. The engine is most efficient, and produces the most

power, when the primary turbo is pressurizing the intake at exactly 40% of the overall intake pressure. Greenspeed's custom twin turbo consists of a primary (high volume, low pressure) turbo feeding into a secondary (low volume, high pressure) turbo. The secondary turbo has a waste gate that controls the pressure differential between the two turbos. Traditional waste gates use a spring regulator to control the pressure, but this doesn't provide accurate control. Greenspeed fitted a proportional valve to act as the waste gate and monitor the differential pressure between the intake pressures of and the exhaust. Adrian Rothenbuhler, the lead systems engineer, explains, "The closed-loop PID-controlled turbo charger regulator keeps the boost pressure at an optimal level to maximize engine power."

## Suspension

The front suspension uses the stock geometry with beefed up coil-over shocks to support the weight of the larger engine. The stock rear suspension was a leaf type, but Greenspeed wanted to make some major modifications to the rear end of the vehicle, mostly to accommodate a NASCAR style 'quick-change' rear end. The quick-change rear end allows the team to make adjustments to the final drive ratio very quickly between runs, but installing it required rebuilding the frame of the vehicle from the cab back. They selected a 'four link' suspension to complete the modifications to the rear of the truck.

Greenspeed also plans to automate the suspension, with the use of analog proximity sensors to measure the ride height at each corner of the vehicle. With known spring rates, and measured ride height, Greenspeed will be able to calculate the down force acting on the vehicle. As opposed to some other types of racing, if top speed is your goal, then the desired down force follows the Goldilocks principle: You want just enough down force to stay on the ground and have good steering response. Anything more is just slowing you down.

Greenspeed has done some preliminary testing on this concept, and even had the sensors mounted and wired



# Business Notes

## Goings-on in the Industry

in 2011, but this system was not operational (another casualty of their compressed building schedule). They have a two-phase plan to complete the implementation. In 2012, they plan to begin logging data from the sensors during each run and making manual adjustments to the ride height between runs to optimize down force at a particular speed. Beyond that, they hope to add actuators at each corner to dynamically control the ride height to optimize down force at all speeds. In both years, they will also be able to alert the driver if down force ever drops below a minimum threshold.

### Events in 2011:

With just two and a half months to build their entry, the students transported the almost completed truck six hours from Boise to the Mecca of high speed, the Bonneville Salt Flats for Speed Week 2011. Once they arrived, they completed the build on the salt. They had to overcome several last minute issues but finally passed the technical and safety inspections the last night of the event, and made it to the start 50 minutes before the event ended where they completed the last two runs of the event (for any competitors) – but were unable to post any times or records. Everyone they met at Bonneville offered their encouragement; most were in disbelief of what the team had accomplished in the short time frame. The team returned to Boise, started fall classes the next day, and started preparing for the next event.

After spending some much needed time tuning the engine on a dynamometer, the team returned to the salt flats a month later for the “World of Speed” event. This time the team was much better prepared, and they passed inspection with flying colors. But on their first high speed run, at the half mile mark, at over 140 mph, two cylinders cracked, and thus ended any hopes for a record at that event.

Again the team returned home; this time with a major engine rebuild awaiting them, and only three weeks before the last event of the year at Bonneville, the World Finals, in October. The team and their sponsors

Continued, p. 23>>

### AutomationDirect products nab multiple awards from magazine readers

The 2012 Engineers Choice Award winners from Control Engineering magazine have been announced, and the Remote HMI app for C-more won the top honor for the Mobile apps category in Software.

The Remote HMI App allows users to control a machine or process from an iPhone, iPad, or iPod touch as though they are physically in front of the C-more Panel (with “Full Control mode”), or the ability to configure the settings for “View Only”, or “View and Screen Change Only” for those applications that are more presence sensitive.

Users need only to configure the network settings in the panel project and connect the panel to a network. The C-more Remote HMI app is available on the App Store (SM) for only \$4.99.

AutomationDirect was also honored to learn of our placement in multiple product categories in the Leadership in Automation poll sponsored by Automation World magazine throughout 2011. We are “First Team Leaders” in PLCs, Programmable Automation Controllers, pressure sensors/transmitters and temperature sensors/transmitters. Thanks to everyone who voted!

Automation World’s sister publication, Packaging World, is conducting a similar poll for 2012 for packaging equipment suppliers, and AutomationDirect is listed in the Controls and Automation category. The twist on this “Leadership in Packaging” poll is that the company that garners the most voter participation is designated the “Promotional Leader”, and a \$2,500 scholarship will be donated in their and Packaging World’s names to their choice of a college or university with a packaging program. So help us support our aspiring engineers and use this URL to vote for AutomationDirect:

<http://bit.ly/pwvote>

### New PID video series on Learn site

Our newest video series on the Learn Web site, “PID for the Productivity3000 controller”, starts with the basics. Part 1 is “What is a PID and what does it do?” Part 2 covers “How Does a PID work?” Part 3 shows an example of a PID loop in operation. Starting with Part 4, they delve into the details of how to configure the PID instruction in the Productivity3000 ladder program, and other supporting logic. There are a total of eleven videos in this series.

And to keep up with new products, take a few minutes to watch our popular “Kickstart” videos. They’re 2 to 5 minute summaries of new additions such as safety glasses, dial pressure gauges and thermometers, and soft starters. To see the entire playlist, click on the “Kickstart Videos” link. Also new are over 20 prerecorded Webinars from our AutomationTalk site now available on Learn and our YouTube channel.

For all videos, visit:

<http://learn.automationdirect.com>.

### Media Gallery feature on Store site offers detailed product information

You want as much information about a product as possible, and we’ve added a feature to the online store that will give you a lot more visual information. On the item level page for many products, you will see a “Media Gallery” icon underneath the photo. Click on the icon and you’ll see more detailed photos of the product from various views, labels, packaging, and even videos if available.

For example, visit our new WERMA stack lights category on the store, and drill down to the item level page for an indicating element. Using the Media Gallery, you can view photos of the product components and a video

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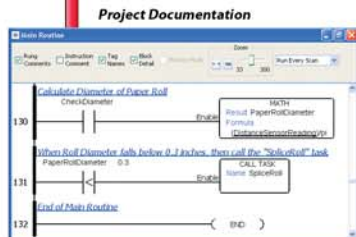
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- **Plug-and-play USB or Ethernet programming and monitoring**
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- **Two serial ports for peripheral device interface or controller networking** (no serial communication or ASCII module needed)
- **USB port for data logging to removable drive and project transfer**

The **50Mb memory** supports large programs, complete with tag name database and program documentation stored onboard. And with a **huge (100,000+) I/O capacity**, the Productivity3000 can handle just about any system you need.

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[www.productivity3000.com](http://www.productivity3000.com)

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## Student Spotlight cont.

Continued from, p. 21

pulled off a Herculean effort and had the truck ready to run, only to hear that the event was cancelled due to rain. Not to be deterred, the team reevaluated their options, crossed their fingers, and decided to make the 16-hour drive to the final SCTA event of the year in Southern California at the El Mirage Dry Lakebed. It was a risky decision: a very long drive, a questionable weather forecast, and a very short course. But it paid off handsomely: the first run on Saturday clocked in at 139.882 mph, followed on Sunday by a second run at 155.331 mph!

So, with considerable perseverance the team shattered the previous recorded top speed for a vegetable oil-powered vehicle. Team Greenspeed is looking forward to returning to Bonneville for Speed Week 2012 with all of the improvements; they also plan to outfit the truck to run biodiesel and petroleum diesel as well as vegetable oil. They even have their eyes on some oil that's extracted from algae that has been grown at Boise State. With the dedication this team showed in 2011, it's hard to image anything but a bright, fast and green future for these students.

Learn more about the team, and meet all the members at the team's website: <http://greenspeed.me>

Photos and YouTube videos are also available at the site.

## Business Notes cont.

Continued from, p. 21

that depicts all the indicating elements available and how they look in comparison to each other. Now you can see what "blinking" vs. "flashing" really means!

We've just started this project, so we continue to populate all our product pages with more visual content. If there is something you would like to see, email us at: [marketing@automationdirect.com](mailto:marketing@automationdirect.com).

# The Break Room

BRAINTEASERS



By Chip McDaniel

## BrainTeasers

### Alignment Time:

1.) On a functioning clock, the hour and minute hand are perfectly aligned (superimposed, not opposed) several times each day. *Can you determine a formula to calculate those times?*

*How about for the minute hand and a sweep-second hand? How about for all three hands?*

### Real-Time Conversation

2.) A man in Florida decided to call his friend in Oregon. During the conversation he mentioned what time it was. The woman in Oregon said, "You mean here in Oregon?" The man in Florida said, "No, that's what time it is here in Florida". The woman, still in Oregon, said, "That's odd, that's exactly what time it is here, also!" Both were right. *How can this be?*

### Chime Time

3.) *If a clock takes 7 seconds to strike 7:00, how long will the same clock take to strike 10:00?*

### Automagic Controls?

4.) Fred spent a few minutes last week and added an AutomationDirect component to his factory's control system. He made no electrical connections whatsoever to this device, but still the machine's operators were delighted with the real-time information this device provided. *Do you know what this helpful device was?*

"Every day I get up and look through the Forbes list of the richest people in America. If I'm not there, I go to work."

– Robert Orben

"Time flies like an arrow; fruit flies like a banana."

– Unknown

"Once you have mastered time, you will understand how true it is that most people overestimate what they can accomplish in a year - and underestimate what they can achieve in a decade!"

– Tony Robbins

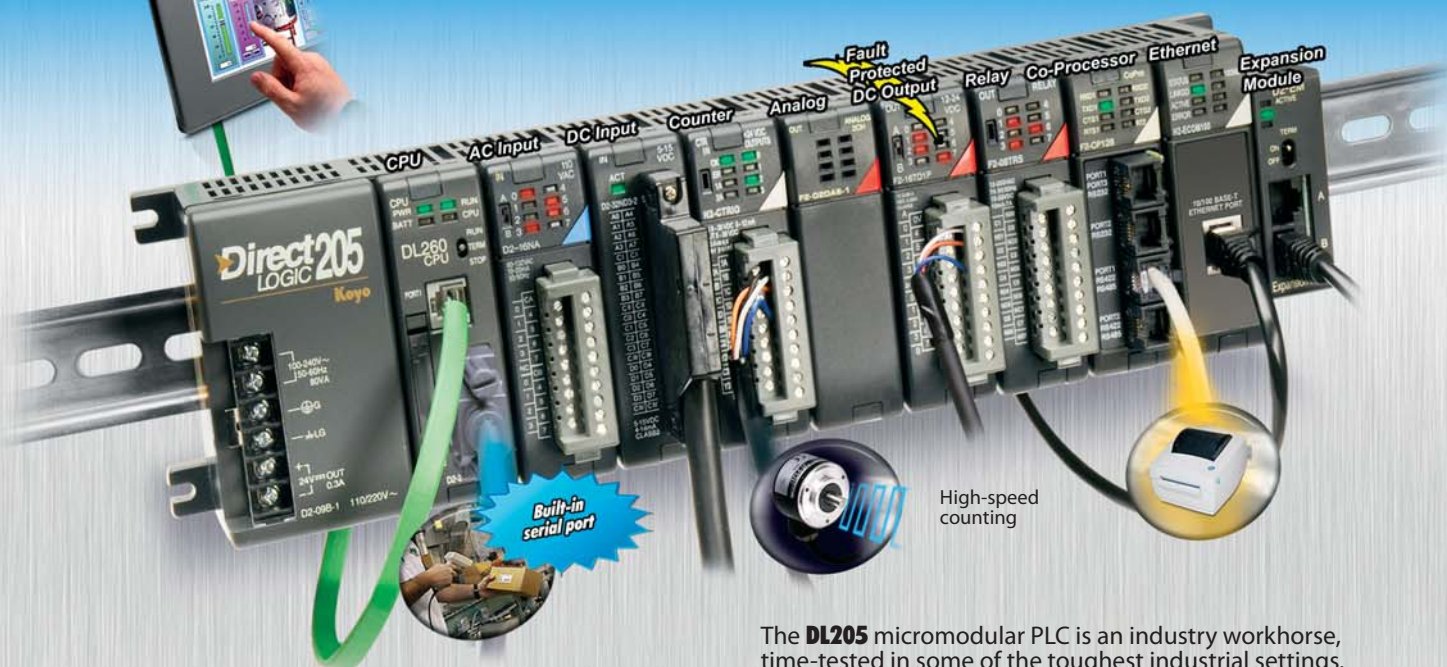
"There's a fine line between fishing and just standing on the shore like an idiot."

– Steven Wright

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Analog Modules	4-channel input (current)	\$199		\$485.81
	4-channel thermocouple in	\$299		\$986.77 (6-ch)
	8-channel output (voltage)	\$269		\$1,430
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\* All prices are U.S. published prices. Prices and specifications may vary by dealer and configuration. AutomationDirect prices are from October 2011 Price List. Allen-Bradley prices are based on [www.rockwellautomation.com/en/e-tools](http://www.rockwellautomation.com/en/e-tools) 08/31/11.

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